



Subject card

Subject name and code	Separations techniques of biomolecules, PG_00038083						
Field of study	Biotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Microbiology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Rafał Piątek				
	Teachers		dr hab. inż. Rafał Piątek dr hab. inż. Marta Wanarska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		3.0		2.0	50
Subject objectives	Familiarize the student with the techniques used in the separation of biomolecules for example proteins.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W09		The student is able to apply knowledge of general chemistry, physical and quantum chemistry in understanding the properties of biomolecules relevant to separation techniques. The student is able to present knowledge in the field of biomolecule chromatography		[SW1] Assessment of factual knowledge		
	K6_U09		The student is able to apply the following chromatographic techniques: gel chromatography, ion exchange chromatography, affinity chromatography, hydrophobic chromatography.		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Separating biomass from the culture medium; cell disintegration; protection of proteins against degradation. 2. Selective precipitation of components of the mixture (Franz Hofmeister, ion specific phenomena); selective degradation of mixture components. 3. Gel chromatography. 4. Ion exchange chromatography. 5. Affinity Chromatography. 6. Hydrophobic interaction chromatography. 7. Electrophoretic techniques (including isoelectric focusing - Rotofor Cell Bio-Rad; 491 Prep Cell Bio-Rad). 8. Filtration techniques. 9. Protein purification under denaturing conditions and refolding. 10. Apparatus and detectors. 11. Strategies for purifying proteins from post-culture fluid, cell cytoplasm and periplasmic space. 12. Examples of protein purification in laboratory conditions (own research). 13. Examples of purification of proteins produced on an industrial scale. <p>Laboratory:</p> <ol style="list-style-type: none"> 1. Methods of disintegration of bacterial and yeast cells. 2. Gel chromatography. 3. Ion exchange chromatography. 4. Affinity Chromatography. 5. SDS-PAGE electrophoresis of elution fractions. 6. Buffer exchange methods: dialysis, ultrafiltration. 											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 875 794 902">Subject passing criteria</th> <th data-bbox="799 875 1137 902">Passing threshold</th> <th data-bbox="1142 875 1469 902">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 909 794 936">Laboratory</td> <td data-bbox="799 909 1137 936">60.0%</td> <td data-bbox="1142 909 1469 936">50.0%</td> </tr> <tr> <td data-bbox="456 943 794 969">Lecture</td> <td data-bbox="799 943 1137 969">60.0%</td> <td data-bbox="1142 943 1469 969">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	50.0%	Lecture	60.0%	50.0%
Subject passing criteria	Passing threshold	Percentage of the final grade										
Laboratory	60.0%	50.0%										
Lecture	60.0%	50.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>The Busy Researcher's guide to biomolecule chromatography. PerSeptive Biosystems 1996.</p> <p>The Physical Basis of Biochemistry. PR. Bergethon. Springer 2000.</p> <p>Source information from the GE website.</p> <p>No need.</p>										
Example issues/ example questions/ tasks being completed	<p>Physicochemical parameters of proteins used in chromatographic techniques.</p> <p>The influence of sample preparation on the effect of chromatographic separation.</p> <p>The course of separation using gel permeation chromatography.</p> <p>The course of separation using ion exchange chromatography.</p> <p>The course of separation using the hydrophobic chromatography technique.</p> <p>The course of separation using affinity chromatography.</p> <p>Biomolecule detection methods.</p> <p>Designing a multi-stage chromatographic process.</p> <p>Designing the process of purifying protein forming inclusion bodies.</p> <p>Designing the process of refolding denatured protein.</p> <p>Electrophoretic techniques in protein chromatography.</p>											
Work placement	Not applicable											